

NOTES AND NEWS

THE YOLLA BOLLY MOUNTAINS OF CALIFORNIA: NEW RECORDS AND PHYTOGEOGRAPHICAL NOTES.—The authors spent three summers in the Yolla Bolly Mts. collecting information for a report on the natural values of the area (Keeler-Wolf and Keeler-Wolf, A contribution to the natural history of the Yolla Bolly Mountains of California, senior thesis, Univ. California, Santa Cruz, 1974). During this period, and more sporadically in the past several years, a large number of new distribution records of vascular plants were accumulated for the area.

The Yolla Bolly Mts. comprise the northern half of the high (1500 m+) Inner North Coast Range (INCR) of California. They extend south ca. 46 km from the region of Black Rock Mt. and the North Yolla Bolly Mts. in northwestern Tehama and Southeastern Trinity Counties to Mendocino Pass (1525 m) along the Mendocino-Tehama County border. The southern INCR has no generally accepted inclusive name (Heckard and Hickman, *Madroño* 31:30–47, 1984). Both the north and south halves are similar geologically and are primarily composed of metamorphic and sedimentary rocks of the Franciscan Assemblage (Bailey et al., *Bull. Calif. Div. Mines Geol.* 183:1–177, 1964). The INCR is largely geologically distinct from the adjacent Klamath Province except for the belt of South Fork Mt. Schist, which forms the ridge between Black Rock, N. Yolla Bolly, and Tomhead Mts. and is considered to be a gradational series between the rocks of the metamorphosed Franciscan belt and the W. Klamath Province (Irwin, *Bull. Calif. Div. Mines Geol.* 190:17–37, 1966). To the north, the Yolla Bolly Mts. are separated from the Trinity Alps by ca. 60 km of lower (largely under 1500 m) mountains.

Both halves of the INCR are floristically closely related and share an extensive cover of mixed conifer forest on slopes between ca. 1100 and 1800 m. Below this forest belt are large tracts of northern oak woodland interspersed with patches of natural grassland with affinity to the coastal prairie community. Douglas fir forest occurs in the mesic low elevation canyons. There are large areas of serpentine and non-serpentine chaparral on the lower slopes of the eastern side of the INCR.

The Yolla Bolly Mts. are higher in elevation than the southern half of the INCR. Ten peaks rise to over 2135 m, compared to only three in the southern INCR. The montane area (above 1500 m, as defined here) is larger and less fragmented by intervening deep canyons than in the southern INCR. Plant communities such as red fir forest, montane meadows, and riparian thickets are characteristically more extensive and richer in species than corresponding communities in the southern INCR. The two highest mountain masses, the North and South Yolla Bolly Mts. (2395 and 2466 m) support small areas of subalpine forest dominated by *Pinus balfouriana*. Subalpine forest is not represented in the southern INCR.

In addition to having a more extensive and diverse montane zone than the southern INCR, the Yolla Bolly Mts. also have higher mean annual precipitation (ca. 2050 mm max. vs. ca. 1780 mm for southern INCR; Karhl, *The California water atlas*, 1979), and are closer to the large montane area of the Klamath Province, which must have acted as a source for recolonization of many higher elevation taxa in the Pleistocene.

The above factors are principally responsible for the large number of vascular plants reaching their southern range limits in the Yolla Bolly Mts. Currently, 105 taxa are known to occur no farther south in the California coast ranges. This is nearly as many taxa (123) as reach their southern range limits in the vicinity of Snow Mt., the southernmost 2100-m peak in the INCR (Heckard and Hickman, *op. cit.*). Many of these taxa are typical, widely occurring montane species such as *Antennaria alpina* subsp. *media*, *Luetkea pectinata*, *Oxyria digyna*, *Pinus monticola*, *Populus tremuloides*, and *Tsuga mertensiana* and have been previously reported for the area (Jepson, *Res. Pap. PSW-82*, 1972). However, the highest elevations (over 2134 m) are roadless. A manual of the flowering plants of California, 1925; Munz, *A California flora*, 1959; Griffin and Critchfield, *The distribution of forest trees in California*, USDA For. Serv.

and have been little visited by collectors (though both Jepson and Munz made brief visits). Most (70%) of the 70 new records we report represent southern range extensions of ca. 72–100 km from known locations in the Trinity Alps and other high Klamath Province mountains and were generally found around the higher peaks in the range.

We found ten taxa that represent newly defined northern range limits. Most of these plants occur in the extensive serpentine and non-serpentine chaparral on the eastern side of the Yolla Bolly Mts. The new records extend the known ranges of these plants 50–80 km from low elevation INCR locations in Lake, Colusa, and Mendocino Counties.

Two lowland taxa from Humboldt and Del Norte Counties, *Lathyrus delnorticus* and *Holodiscus discolor* var. *delnortensis*, were found to reach new southern limits in the Douglas fir forests on the western side of the Yolla Bolly Mts. Five typically lowland coastal taxa were also found well above their listed elevational limits, probably as a result of the close proximity of high elevation forest communities to relatively mesic lowland coastal forest in these mountains.

Perhaps the most interesting of the following categories of range extensions are the six species known from the Cascade-Sierra Cordillera, but which are apparently absent from the intervening mountains of the Klamath Province. This discrepancy may be due to insufficient collecting in the Klamaths. However, one conspicuous taxon, *Juniperus occidentalis* subsp. *australis* is already known to follow this pattern (Griffin and Critchfield 1972). It seems more likely that these species have found their present refugia in these relatively xeric mountains following the Xerothermic Period, when the Klamath Province mountains may have become unsuitably mesic.

In the following list all taxonomy, unless otherwise noted, is in accordance with Munz (A California flora, 1959; Supplement to California flora, 1968). All cited collection numbers represent material of the authors deposited at JEPS. An asterisk signifies a taxon that we feel was positively identified in the field, but is not yet represented by voucher material.

I. Plants reaching newly defined southern limits of distribution:

A. Montane taxa (typically occurring above 1500 m in nw. Calif.) with nearest known stations in the Trinity Alps (Ferlatte, A flora of the Trinity Alps of northern California, 1974).

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| <i>Acer glabrum</i> var. <i>torreyi</i> 650. | <i>Lupinus albicaulis</i> 26. |
| <i>Arabis holboellii</i> var. <i>retrofracta</i> 189. | <i>Mitella pentandra</i> 392. |
| <i>Arnica mollis</i> 543. (Most individuals fit this description well, but a few showed affinities with <i>A. longifolia</i> subsp. <i>myriadenia</i> .) | <i>Mitella trifida</i> 286. |
| <i>Aster alpigenus</i> subsp. <i>andersonii</i> 399. | <i>Poa pringlei</i> 666. |
| <i>Calamagrostis purpurascens</i> .* | <i>Poa canbyi</i> .* |
| <i>Caltha howellii</i> .* | <i>Polemonium pulcherrimum</i> 365. |
| <i>Carex spectabilis</i> .* | <i>Pyrola asarifolia</i> var. <i>purpurea</i> 540. |
| <i>Cryptogramma acrostichoides</i> 357. | <i>Pyrola secunda</i> 297. |
| <i>Eriophyllum lanatum</i> var. <i>lanceolatum</i> 363. | <i>Ribes lacustre</i> 573. |
| <i>Erythronium grandiflorum</i> var. <i>pallidum</i> 170. | <i>Salix jepsonii</i> 670. |
| <i>Habenaria sparsiflora</i> 398. | <i>Salix commutata</i> 382. |
| <i>Juncus mertensianus</i> 503. | <i>Sanguisorba annua</i> 580. |
| | <i>Scirpus congdonii</i> .* |
| | <i>Sidalcea oregana</i> subsp. <i>spicata</i> 373. |
| | <i>Stipa occidentalis</i> 667. |
| | <i>Valeriana capitata</i> subsp. <i>californica</i> .* |

B. Montane species previously known from other mountain ranges in the Klamath Province (Munz, A California flora, 1959; Lewis, The plant communities of the Marble Mountain Wilderness Area, California, M.S. thesis, Pacific Union College, 1966; Muth, A flora of the Marble Valley, Siskiyou County, California, M.S. thesis, Pacific Union College, 1967; Sawyer and

Thornburgh, The ecology of relict conifers of the Klamath region, in-house report for U.S. For. Serv. PSW, Berkeley, Calif.).

Aster occidentalis var. *intermedius*.* *Deschampsia caespitosa*.*
Berberis aquifolium.* *Montia cordifolia* 352.
Botrychium simplex 651. *Montia sibirica* var. *heterophylla* 156.
Calamagrostis breweri.* *Polemonium californicum*.*
Cardamine breweri 482. *Polystichum lonchitis* 575.
Carex ormantha.* *Potentilla drummondii* 492.
Carex stramineiformis 668. *Smilacina racemosa* var. *glabra* 2.
Dentaria tenella var. *palmata* 197.

- C. Montane species previously known from the Sierra Nevada or Cascade Range but unknown from the Klamath Province (nearest known stations adjacent to Klamath Province generally in Modoc or E. Siskiyou Co., Munz op. cit.).
Eriogonum ovalifolium var. *nivale* in the INCR; Zoe 4:168-176, 662. 1893.)
Erigeron compositus var. *glabratus* *Lonicera involucrata* var. *flavescens* 661. 216. (This taxon may also be known from Russian Pk. in the Klamath Mts., Sawyer and Thornburgh op. cit.)
Haplopappus uniflorus 538. (Some individuals resemble *H. apargioides* and may be responsible for Brandegee's report of this species *Ribes montigenum*.*)
D. Plants with previous southern limits known from low elevation mesic coastal forests in Del Norte and Humboldt Counties.
Holodiscus discolor var. *delnortensis*.* *Lathyrus delnorticus* 268.

II. Plants reaching newly defined northern limits of distribution:

- A. Chaparral species generally restricted to serpentine, with nearest known stations in Lake or Glenn Counties.
Astragalus clevelandii 516. *Madia hallii*.*
Ceanothus jepsonii var. *albiflorus* *Streptanthus breweri* 584.
657. *Zigadenus fontanus*.*
B. Chaparral or low montane species with nearest known stations in Lake or Mendocino Counties.
Cirsium coulteri.* *Salvia columbariae* 672.
Dicentra chrysantha.* *Senecio douglasii* 658.
Juncus mexicanus 656.

III. Plants reaching newly defined high elevation limits:

- A. From adjacent mesic coastal forests.
Anemone quinquefolia var. *grayi* 186. *Fritillaria mutica* Lindl. 180. (to 1828 m)
(to 1828 m and north from Sonoma Co.) *Trillium chloropetalum* 90. (to 2012 m)
Fritillaria lanceolata 181. (to 1875 m) *Trillium ovatum* 574. (to 1920 m)
B. From adjacent chaparral or lower montane habitats.
Erythronium californicum 177. (to 1676 m) *Lessingia nemaclada* 369. (to 2012 m)
C. From lower elevation moist habitats.
Eryngium articulatum 549. (to 1067 m) *Petasites palmatus* 144. (to 1280 m)

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with us.—T. KEELER-WOLF and V. KEELER-WOLF, 943 Aquarius Way, Oakland, CA 94611. (Received 10 Nov 82; accepted 6 Sep 83.)

CHROMOSOME NUMBERS AND CYTOGEOGRAPHIC PATTERNS IN *Claytonia perfoliata* AND *C. parviflora* (PORTULACACEAE).—Previous studies reported a euploid series from diploid to decaploid in the *Claytonia perfoliata* complex (Miller, Syst. Bot. 3:322–341, 1978). The purpose of this note is to report hitherto cytologically unknown populations of *C. perfoliata* Willd. and *C. parviflora* Hook. These chromosome numbers expand the known ranges of diploids, tetraploids, hexaploids, and decaploids and, in addition, provide interesting insight into phylogeographic patterns of the group. Vouchers for the following chromosome counts are deposited in OSC:

Claytonia perfoliata Willd. $2n = 12$ (as 6 bivalents): Mexico, Estado Baja California, Isla Guadalupe, Moran 25837-S₁; Estado Queretaro, Cerro Zamorano Ornduff 8583-S₁, U.S.A., Graham Co., AZ, Pinaleño Mts., Frye Canyon, Miller 802; Maricopa Co., AZ, Apache Trail at Fish Creek Canyon, Miller 878. $2n = 24$ (as 12 bivalents): Pinal Co., AZ, Santa Catalina Mts., Nugget Canyon e. of Oracle Ridge Reeder & Reeder 6842-S₁. $2n = 36$ (as 18 bivalents): Gila Co., AZ, Fossil Creek Canyon, Miller 870; Maricopa Co., AZ, Roosevelt Dam, Miller 800. $2n = 60$ (as 30 bivalents): Guatemala, Departamento Totonicapán, Sierra Madre near San Cristobal Totonicapán, Miller 759, 760.

Claytonia parviflora Hook. $2n = 12$ (as 6 bivalents): U.S.A., Fresno Co., CA, ne. of Trimmer, Miller 767-S₁, $2n = 36$ (as 18 bivalents): Eldorado Co., CA, Middle Fork American River Canyon near Auburn, Miller 737.

The discovery of additional stations for diploid *C. perfoliata* in the mountains of southeastern Arizona, Guadalupe Island, and Queretaro was predictable on the basis of morphology. These collections possessed deltoid and mucronate mature basal leaves, a feature characteristic of diploids reported in earlier work. On the other hand, the existence of one population of decaploids in the Guatemalan Highlands is surprising in view of its phylogeographic position at the southern limit of the species. Other populations of *C. perfoliata* are known from Guatemala including those indigenous to the limestone Cordillera de los Cuchumatanes and volcanic Sierra Madre (Standley and Steyermark, Fieldiana (Botany) 24:209–210, 1945), although the chromosome number of these populations is unknown. Both Guatemalan collections and one from Volcan Tacaná, Chiapas, exhibited typical diploid basal leaf morphology. Decaploids referable to *C. perfoliata* have been reported from central Oregon and the Columbia River Gorge (Miller, Syst. Bot. 1:20–34, 1976). Long distance dispersal of seed from Oregon to the Guatemalan Highlands is unlikely. A more plausible hypothesis would be thousands of years of self-fertilization in the Guatemalan plants incorporating fusion of unreduced gametes.

Diploids and putative autopolyploids of *C. perfoliata* may now be viewed as constituting a series of disjunct populations spanning the west American cordillera from the California Coast, Transverse, and Peninsular Ranges (including the Channel Islands), through isolated pockets in the mountains of the Sonoran Desert, to the Sierra Madre Occidental, Trans Mexican Volcanic Belt, and Guatemalan Highlands. This phylogeographic pattern is consistent with a hypothetical Pliocene or early Pleistocene occurrence of continuous diploid populations that fluctuated in size during alternating arid and fluvial climates. This view does not explain the distribution of diploid *C. perfoliata* on the volcanic, oceanic Isla Guadalupe. Unlike the Channel Islands of California, Guadalupe Island was probably not connected to the mainland of Mexico. Therefore seed of diploid *C. perfoliata* was probably dispersed to the island by birds or man. I thank Reid Moran, Robert Ornduff, and John and Charlotte Reeder for